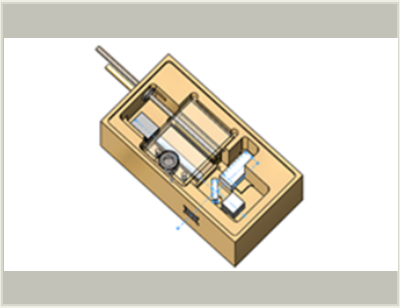
Compact UV Laser, Phase I

Completed Technology Project (2017 - 2017)

Project Introduction

In response to the development of components to advance the maturity of science instruments focused on the detection of evidence of life in the Ocean Worlds, Q-Peak proposes to develop a compact, robust, efficient, and radiation hardened UV laser capable of detecting organic molecules by means of the laser desorption technique. When slightly modified, the laser can be used to advance the development of instruments suitable for deployment on in-situ planetary and lunar missions such as ExoMars and Mars 2020 to analyze mineral composition of rock samples by performing imaging/Laser-Raman/Laser-Induced-Breakdown spectroscopies. The advantage in using these techniques for planetary science is the ability to rapidly collect a wealth of chemical information, by directing a laser beam on target of interest. In Phase I, Q-Peak proposes the development of an ultra-compact, passively Q-switched laser, < 10 cm3 in volume that will produce 0.1-0.3 mJ energy, < 2 ns, 266-nm pulses at 5 kHz repetition rates. This laser will be designed to survive shock, vibration, thermal cycling, and radiation. In order to make a very compact laser, Q Peak will use diode pumped solid state laser technology to produce 1-2 mJ of energy at 1064 nm using a Cr4+:YAG saturable absorber as the passive Q-switch to eliminate the need for a high voltage supply which is required for actively Q-switched lasers. The output of the laser will be frequency converted in two stages to produce 266 nm via nonlinear crystals specifically selected to survive a high radiation environment. Compact electronics will also be designed from radiation hardened components. In Phase II program, specially designed optical components will be procured to make the laser very compact and alignment insensitive; for example, bonded nonlinear crystals to minimize wavelength walk-off and maximize nonlinear conversion efficiency. The laser will be subjected to representative environmental condition to bring the TRL to 6.



Compact UV Laser, Phase I Briefing Chart Image

Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Q-Peak, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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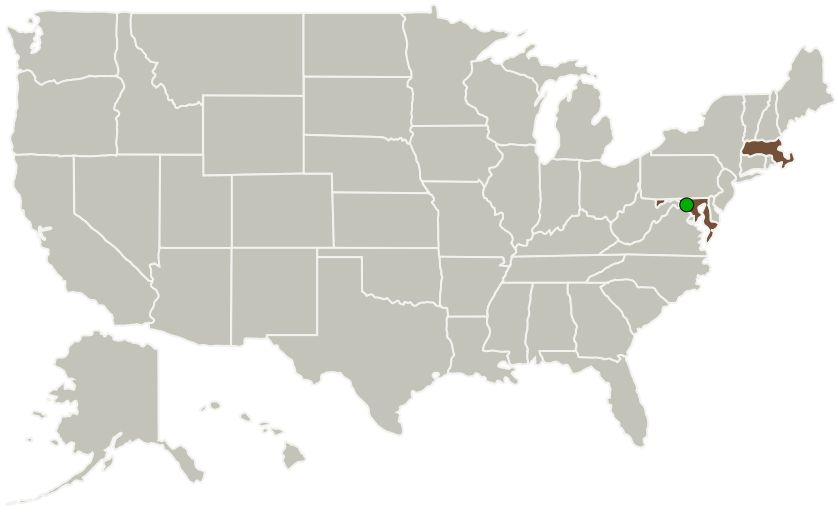
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Q-Peak, Inc.	Lead Organization	Industry	Bedford, Massachusetts
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Maryland	Massachusetts

Project Management

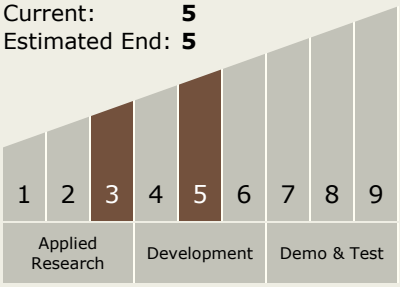
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Bhabana Pati

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.5 Lasers

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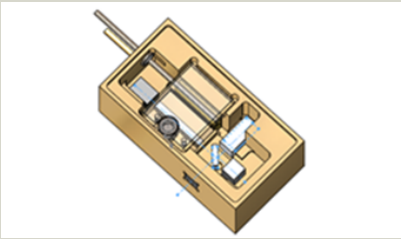
Images



Briefing Chart Image
Compact UV Laser, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/134039)